



**Billing Code: 4163-18-P**

**DEPARTMENT OF HEALTH AND HUMAN SERVICES**

**Centers for Disease Control and Prevention**

**[30Day-20-20HO]**

**Agency Forms Undergoing Paperwork Reduction Act Review**

In accordance with the Paperwork Reduction Act of 1995, the Centers for Disease Control and Prevention (CDC) has submitted the information collection request titled Heat-related Changes in Cognitive Performance to the Office of Management and Budget (OMB) for review and approval. CDC previously published a "Proposed Data Collection Submitted for Public Comment and Recommendations" notice on February 25, 2020 to obtain comments from the public and affected agencies. CDC did not receive comments related to the previous notice. This notice serves to allow an additional 30 days for public and affected agency comments.

CDC will accept all comments for this proposed information collection project. The Office of Management and Budget is particularly interested in comments that:

- (a) Evaluate whether the proposed collection of information is necessary for the proper performance of the functions of

the agency, including whether the information will have practical utility;

(b) Evaluate the accuracy of the agencies estimate of the burden of the proposed collection of information, including the validity of the methodology and assumptions used;

(c) Enhance the quality, utility, and clarity of the information to be collected;

(d) Minimize the burden of the collection of information on those who are to respond, including, through the use of appropriate automated, electronic, mechanical, or other technological collection techniques or other forms of information technology, e.g., permitting electronic submission of responses; and

(e) Assess information collection costs.

To request additional information on the proposed project or to obtain a copy of the information collection plan and instruments, call (404) 639-7570. Comments and recommendations for the proposed information collection should be sent within 30 days of publication of this notice to [www.reginfo.gov/public/do/PRAMain](http://www.reginfo.gov/public/do/PRAMain). Find this particular information collection by selecting "Currently under 30-day Review - Open for Public Comments" or by using the search function. Direct written comments and/or suggestions regarding the items contained in this notice to the

Attention: CDC Desk Officer, Office of Management and Budget, 725 17th Street, NW, Washington, DC 20503 or by fax to (202) 395-5806. Provide written comments within 30 days of notice publication.

#### Proposed Project

Heat-related Changes in Cognitive Performance - New - National Institute for Occupational Safety and Health (NIOSH), Centers for Disease Control and Prevention (CDC).

#### Background and Brief Description

NIOSH, under P.L. 91-173 as amended by PL 95 -164 (Federal Mine Safety and Health Act of 1977), and PL 109-236 (Mine Improvement and New Emergency Response Act of 2006) has the responsibility to conduct research to improve working conditions and to prevent accidents and occupational diseases in U.S. mines. Heat strain is one of these occupational diseases and is an increasing problem among many industries, including mining. As mines expand into deeper and hotter environments, and as heat waves occur with increasing frequency and severity, heat strain among underground and surface miners is likely to increase. Not only can heat strain lead to heat illness, but studies have demonstrated associations between heat exposure and work injuries. Although the underlying mechanism between heat

exposure and injury is not known, reduced cognitive function is likely contributory.

Despite the increasing importance of heat strain in mining, few studies have focused on heat strain among U.S. miners. The few studies that are available have demonstrated that miners often exceed a core body temperature of 38 °C during work activities, which is above the recommended threshold, but more information on frequency, duration, and intensity of elevated core body temperatures is needed in order to focus future heat strain research to better serve the mining industry.

In addition to determining the patterns of duration and intensity of heat strain among U.S. miners, investigating the additional effects of heat strain beyond the risk of heat illness is an important step in improving miner health and safety. Studies have demonstrated associations between heat stress and cognitive deficits, but substantial inter- and intra-individual variability exists in the physiologic and cognitive responses to heat exposure. More information is needed about the most important factors (e.g., age, sex, chronic disease, fitness level, hydration) contributing to individual variability as well as interactions between these factors, because individual variability likely affects the usefulness of one-size-fits-all heat stress indices that are currently used in mining.

Additionally, it is unclear which characteristics of core body temperature (e.g., absolute temperature thresholds vs. rising or falling temperatures vs rate of temperature change) are most associated with cognitive dysfunction. A better understanding of how individual variability and core body temperature relate to cognitive deficits would assist in developing strategies for screening and monitoring miners to mitigate or prevent heat strain. Therefore, this study aims to assess the following objectives: 1) Whether a core body temperature threshold exists at which cognitive performance begins to decline, 2) What factors most contribute to individual variability in cognitive and physiologic responses to heat, and 3) What patterns of duration and intensity of heat strain are most common among U.S. surface and underground miners.

To study these objectives, a dual-arm field and laboratory study will be conducted. The field study will be conducted at surface and underground mines. Data will be collected from miners working in warm or hot areas of participating mines. Participants will swallow temperature pills to measure core body temperature and will wear bio-harnesses to measure heart rate. Two six-minute assessments will be taken during each shift. The assessments include questions on sleepiness and work tasks and a Psychomotor Vigilance Test (PVT) to assess vigilant attention

and reaction time. An initial screening questionnaire as well as post-shift questionnaires will be used to obtain information on risk factors for heat strain and cognitive deficits. The purpose of collecting data at the field sites is to evaluate the frequency, duration, and intensity of heat strain by monitoring core body temperature and heart rate throughout two complete shifts, as well as to assess associations between core body temperature and cognitive deficits.

The laboratory study will be conducted in an environmental chamber, in which environmental conditions can be highly controlled. Data will be collected from miners, construction workers, and firefighters. These three groups were chosen because of their risk of heat exposure and their proximity to the NIOSH laboratory where the study will be conducted. Participants will perform alternating resistance and aerobic exercises followed by brief surveys to evaluate sleepiness (Karolinska Sleepiness Scale), affect (Positive and Negative Affect Schedule), and fatigue. Following these surveys, two cognitive tests (PVT and N-back, which measures vigilance, working memory, and complex tracking) will be administered. Testing will occur at room temperature and in hot conditions to compare cognitive test results between conditions. Participants will swallow temperature pills and wear bio-harnesses to enable

the collection of real-time core body temperature and heart rate data. An initial health screening questionnaire as well as additional questionnaires administered prior to each test will be used to ensure that participants are able to withstand the physical demands of testing and to provide information on factors that affect individual variability to heat tolerance. Additionally, a physical examination and fingerstick blood tests will be used for health screening. The purpose of collecting data in the environmental chamber is to compare physiologic and cognitive measurements at different core body temperatures to evaluate factors contributing to individual variability in cognitive and physiologic responses to heat and to evaluate whether core body temperature thresholds exist above which cognitive deficits are observed.

The total estimated burden hours are 103. There are no costs to respondents other than their time.

#### Estimated Annualized Burden Hours

Type of Respondent	Form Name	No. of Respondents	No. Responses per Respondent	Average Burden per Response (Hours)
	Ingestion of temperature pill	30	2	1/60
	Fitting of chest strap	30	2	1/60

Type of Respondent	Form Name	No. of Respondents	No. Responses per Respondent	Average Burden per Response (Hours)
Miners	Consent form (field)	30	1	30/60
	Health screening questionnaire (field)	30	1	30/60
	Heat stress app - shift questionnaire (field)	30	4	1/60
	PVT cognitive test (field)	30	5	5/60
	Heat stress app - post-shift questionnaire (field)	30	2	10/60
Miners/ firefighters / construction workers	Ingestion of temperature pill	15	3	1/60
	Fitting of chest strap	15	3	1/60
	Consent form (chamber)	15	1	30/60
	Physical examination	15	1	10/60
	Health screening questionnaire (chamber)	15	1	30/60
	Fingerstick blood sample for point-of-care testing	8	1	1/60
	Release of Information (HIPPA)	3	1	1/60
	Borg and thermal scale	15	5	1/60
	PANAS KSS fatigue	15	5	2/60



Type of Respondent	Form Name	No. of Respondents	No. Responses per Respondent	Average Burden per Response (Hours)
	Cognitive test: PVT (chamber)	15	5	10/60
	Cognitive test: N-back	15	5	1/60
	Pre-test screening questionnaire (chamber)	15	2	5/60

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